BLANKOM®

Professional Headend Solutions

Operating instructions

SAT-TV Transmodulator

DVB-S/ S2 → DVB-C/ ITU-T J.83 Annex B, C

Contents

STB 016
Part N°: 9710.02

1. Safety and operating instructions

When assembling, starting-up and adjusting the modules, it is necessary to consider the system specific references in the manual instruction.

The modules may only be installed and started up by authorized technical personnel.

When assembling the modules into the receiving points, the adherence of the EMC regulations is to be secured.

The assembly and wiring have to be done without voltage.

All active modules may only be operated with the Headend Controller HCB x00 or Bus Extender BEB x00.

The main voltage and the operating voltage of the modules working by DC have to be in complience to the operating parameters described in the technical data.

With all work the defaults of the DIN EN 50083 have to be considered. Especially the safety relevant execution of the DIN EN 60728-11[4] is necessary.

2. Device variants

STB 016 9710.02 DVB-S/ S2 → DVB-C/ ITU-T J.83 Annex B, C

Mininum software requirements for HCB x00:

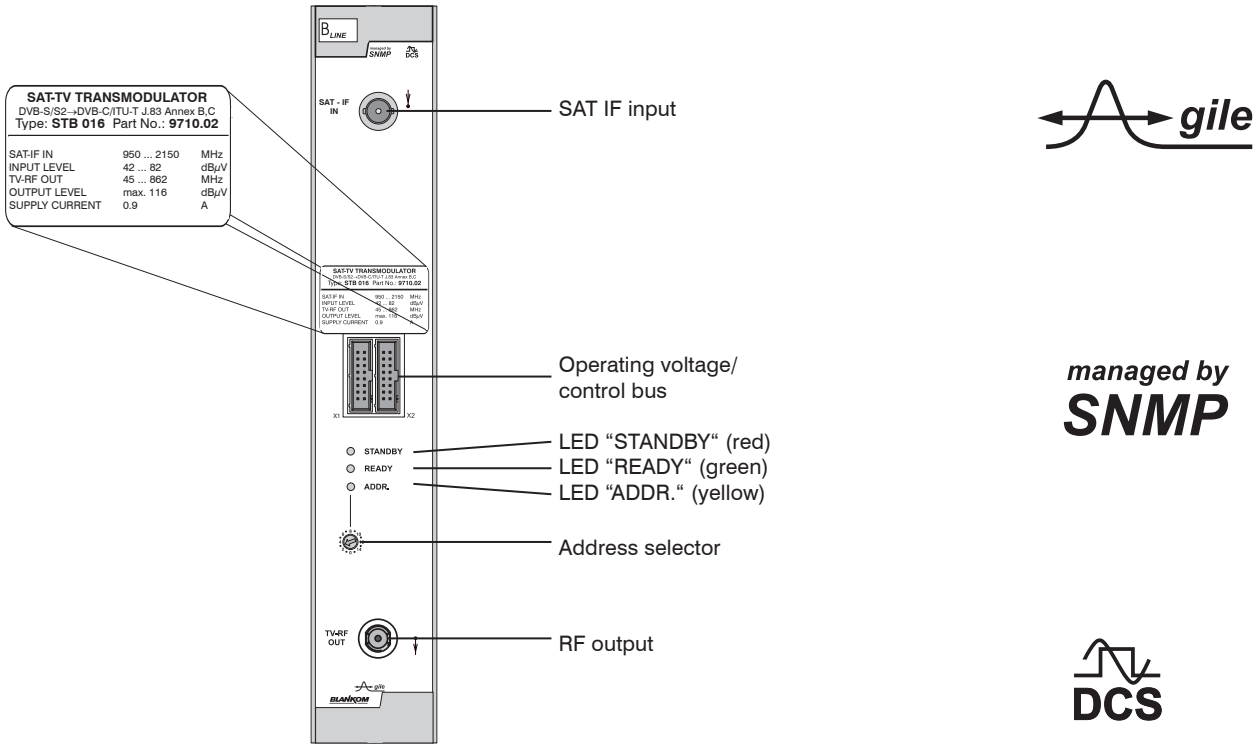
9650.03: version 2.34*
9650.04/.05: version 3.18*
9652.01: version 3.23*
9653.01: version 3.27*
9653.02: version 3.28*

*) Updates: www.blankom.de

3. General

The SAT-TV transmodulator STB 016 is a module of the head end system B-LINE wich is conceived as a complete system for middle-sized networks.The module converts one DVB-S/ S2 transponder into the digital cable standard DVB-C or ITU-T J.83 Annex B or C. The signals will be transcoded into cable TV channels. All modules will be programmed via a central control unit (HCB x00) and are working fully independent afterwards. The status of the modules are displayed via LED's (see chapter 7 "Meaning of status LED's").

4. Front view



5. Functional description

The SAT IF input signal is fed to the DVB-S/ -S2 front end, where the selection of a transponder and its QPSK or 8PSK demodulation is done and a data stream is generated. All services of the resulting transport stream which shall be processed into the QAM modulator will be choosen by controling software of the module. The SI and PSI tables affected (i.e. the PAT, PMT, SDT, EIT) are automatically corrected. The Headend Controller serves to generate an NIT (Network Information Table) into the transport stream. This is required to enable the receiver (such as Set-Top-Box) to tune in automatically. The changed SI an PSI tables are fed into the QAM modulator and an IF signal is generated at the output channel. There is a free choise of frequency in the output channel from 45 to 862 MHz. On the output side, the modulator does not leak to adjacent channels. So that errors in level can be signalled if the load fluctuates (the red LED will flash and a trap message will be sent), a reference level is generated. Every time the level for frequency figures are programmed, automatic measurement of the refence level takes place; this function will, however, not start until 100 seconds have elapsed after start-up of the system. This function can be enabled or disabled in the main menu.

6. Adjustments

6.1 Adjustment with the Headend Controller

· Adjustment of the addresses at the Bus Extender BEB x00 and at the modules
· Activation of the programming mode on each module by selecting the line (BEB x00) and the module position (01... 15) at the Headend Controller (HCB x00) → yellow LED illuminates until the beginning of the parameter adjustment
· Adjustment of the STB 016 parameters (see chapter 9) → green LED is switched on
· After the programming the STB 016 will be automatically switched into the operating mode → yellow LED flashes shortly/ green LED is switched on

6.2 Adjustment with PC/ laptop

· Prerequisite for the remote programming is an "online-connection" acording the IP standard and an ethernet connection at the PC/ laptop
· Adjustment of the line/ position addresses at the Bus Extender BEB x00 as well as at the modules
· At the Headend Controller HCB x00 input IP address (default: 192.168.2.80))
· For "direct connection" between a PC and HCB x00 use crossover cable (RJ 45)
· For connection over a hub use a normal straight throught patch cable
· Start-up HTML browser and put in IP address as target address
· If connected correctly the web interface will be opened on the PC/ laptop and a blue LED (LINK) at the HCB x00 will be lit up.
· All adjustments of the modules are specified on the web interface.

6.3 Adjustment with SNMP

· Prerequisite for the SNMP functionality is the use of HCB x00 with enabled SNMP software option CKB 100.
· Supported is SNMP version 1.0 [3].
· Automatic creation of the MIB based on the current head end configuration by the HCB x00.
· For setting and reading out the parameters and is to receive traps from an SNMP management software required.
· Further notes on the SNMP functionality of BLANKOM modules are listed in the SNMP manual (download: www.blankom.de).

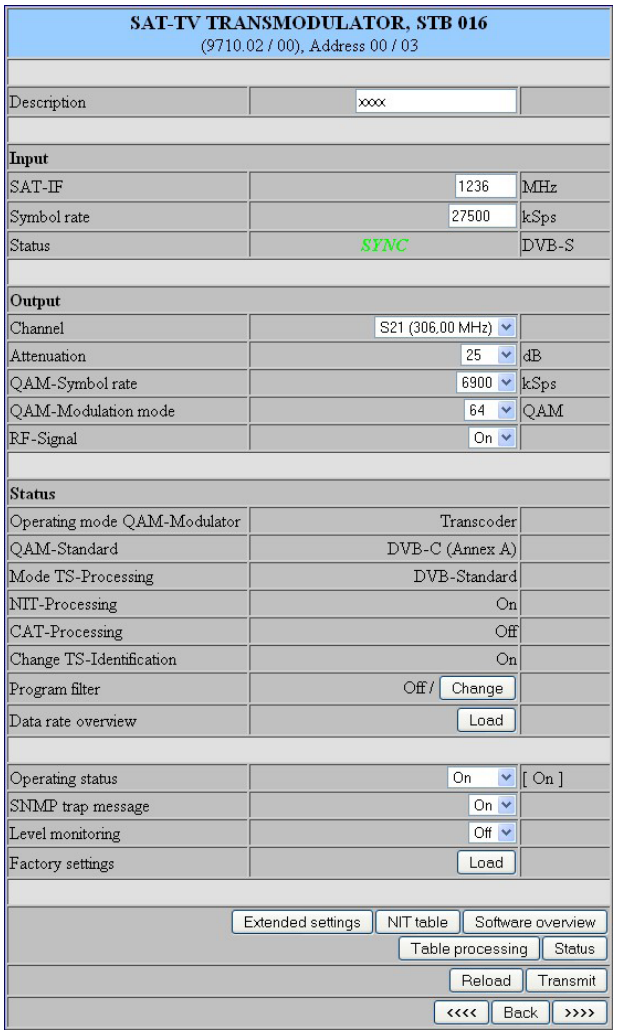
The manual instructions of the Headend Controller HCB x00 and the Bus Extender BEB x00 have to be considered!

7. Meaning of status LED‘s

Designation (Colour))	Status	Meaning of display
STANDBY (red)	permanently on	Module is on standby
	flashing	Module faulty (hardware) or level error
READY (green)	permanently on	Module working, everything ok
	flashing	Dysfunction depending in signal: Tuner not sync (e.g. in case of missing input signal) no input on the QAM modulator buffer overflow in the QAM modulator QAM overflow (input data rate on the QAM modulator too large)
	off	RF output is deactivated
ADDR. (yellow)	illuminated or flashing	Remote control making contact/ data transmission

8. Programming by web server *

8.1 Main menu



Name of device, item number, module address in head end

Description module name (max. 30 characters)

Input
SAT-IF adjustment range: 950 ... 2150 MHz
Symbol rate adjustment range: 2000 ... 45000 MSps
Status display wether **SYNC**hronization or **noSYNC**hronisation with input

Output
Channel channel selection accord. QAM standard:
DVB-C/ Annex A: 2 ... 69, standard B/G
Annex B, C: 2 ... 134, standard M
Attenuation adjustment range: 0 ... 31.5 dB
QAM-Symbol rate selection: 6995, 6900, 6875, 6111, 6000, 3450, 1750 kSps
QAM-Modulation mode selection: 16, 32, 64, 128, 256 QAM
RF-Signal selection: On/ Off

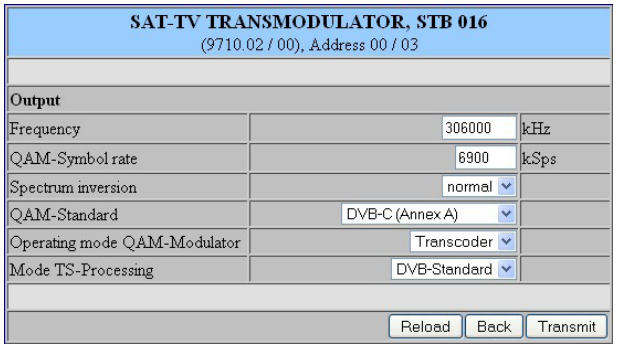
Status
Operating mode QAM-Modulator according adjustment menu 1
QAM-Standard DVB-C (Annex A)/ ITU-T J.83B (Annex B)/ ITU-T J 83C acc. adjustment menu 1
Mode TS-Processing DVB-Standard/ TNT-France acc. menu 1
NIT-Processing On/Off according adjustment menu 2
CAT-Processing On/Off according adjustment menu 2
Change TS-Identif. On/Off according adjustment menu 2
Program filter see menu 5
Data rate overview see menu 6

Operating status selection: On/ Off/ Reset
SNMP trap message selection: On/Off,if SNMP option in HCBx00 enabled, otherwise „locked“ display
Level monitoring On/ Off
Factory settings setting the default values (see menu 9)

Routing to the appropriate adjustment menu
Extended settings see menu 1
NIT table see menu 3
Software overview see menu 8
Table processing see menu 2
Status see menu 7

* Further details on this are to be found in the HCB manual

8.2 Extended settings (menu 1)

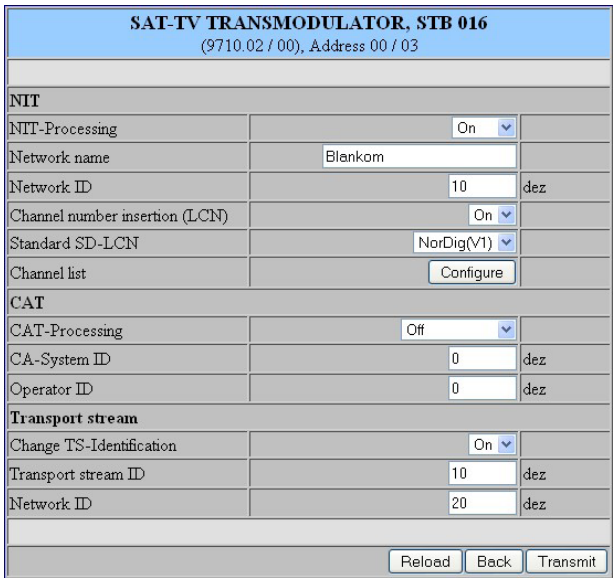


Name of device, item number, address in head end

Output

Frequency	adjustment range: 45000 ... 862000 kHz
QAM-Symbol rate	adjustment range: 1000 ... 7200 kSps
Spectrum inversion	selection: normal/ invers
QAM-Standard	selection: DVB-C (Annex A), ITU-T/ J.83B (Annex B), ITU-T/ J.83C (Annex C)
Operating mode QAM-Modulator	selection: Transcoder, Test level,Test signal

8.3 Table processing (menu 2)



Name of device, item number, module address in head end

NIT

NIT-Processing	selection: On/ Off
Network name	adjustment range: max. 30 characters
Network ID	adjustment range: 0...65535
Channel number insertion (LCN)	selection: On/ Off
Standard SD-LCN	IEC 62216, NorDig(V1)
Channel list	see menu 4

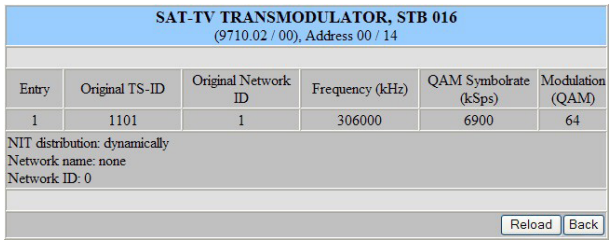
CAT

CAT-Processing	selection: On/ On (CA Filter)/ Off
CA-System ID	adjustment range: 0...65535
Operator ID	adjustment range: 0...65535

Transport stream

Change TS-Ident.	selection: On/ Off
Transp. stream ID	adjustment range: 0...65535
Network ID	adjustment range: 0...65535

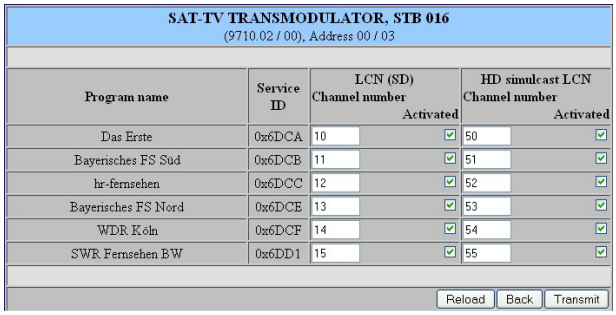
8.4 NIT entries (menu 3)



Name of device, item number, address in head end

NIT entries with all information available

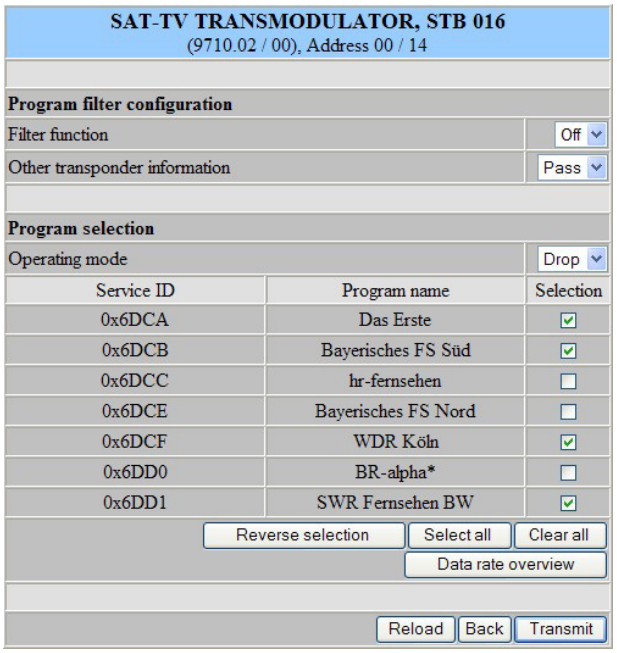
8.5 Configuration channel list-LCN (menu 4)



Name of device, item number, module address in head end

The allocation of a logical channel number (LCN) is a service that allocates a serial number to each TV activated program. If the set-top box supports this service at the subscriber, the TV programs are offered in the order established by program numbers. It should be noted that the numbering is done separately for HD and SD programs for the respective type of the box. The simultaneous activation and number allocation for SD programs in the HD column provides such programs to the appropriatechannel number in the program list for HD boxes.

8.6 Program filter (menu 5)



Name of device, item number, address in head end

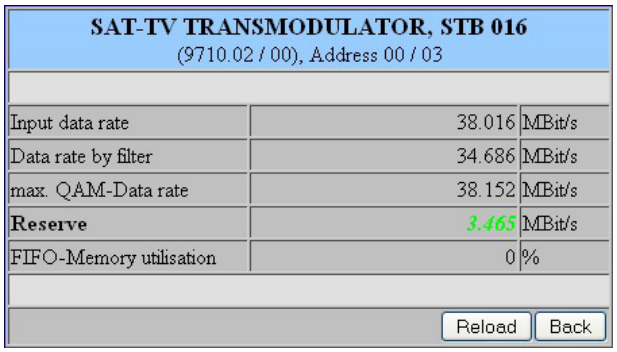
Program filter configuration

Filter function	selection: On/ Off
Other transporder information	pass or drop of additional informations (e.g. electronic program guide), wich are contained in data stream as “other“

Program selection

Operating mode	pass or drop of the marked programs
Reserve selection	all not marked programs are choosen or vice versa
Select all	all programs of the list are marked
Clear all	no program of the list is marked
Data rate overview	routing to menu 6

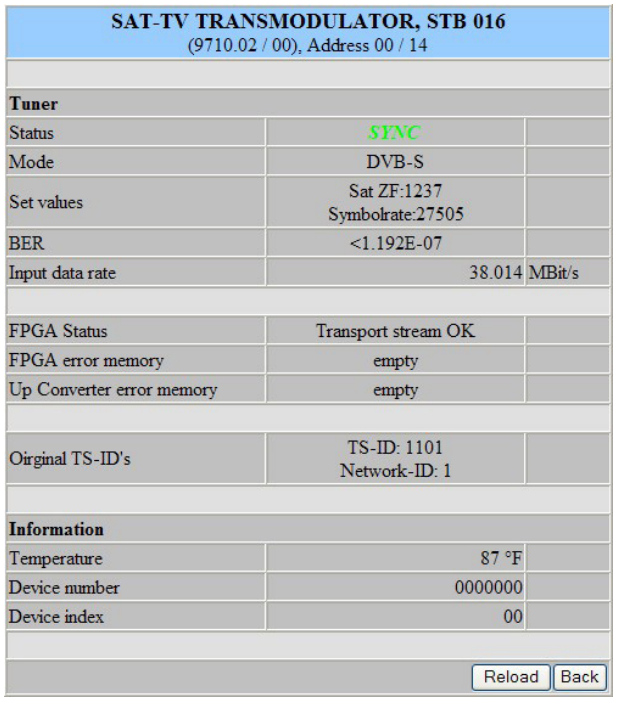
8.7 Data rate overview (menu 6)



Name of device, item number, address in head end

Input data rate	net data rate at the input
Data rate by filter	net data rate by program filters
max. QAM Data rate	max. possible net data rate
Reserve	max. QAM data rate minus data rate by filter
FIFO-Memory utilisation	displays in %

8.8 Device status (menu 7)



Name of device, item number, address in head end

Tuner

Status	displays whether **SYNC**hronization or **noSYNC**hronization
Mode	format of transmission
Set values	displays SAT IF and symbol rate
BER	bit error rate
Input data rate	displays net data rate
FPGA Status	status, transport stream input
FPGA error memory	error memory TS mux, QAM modulator
Up Converter error memory	error memory up converter
Original TS-ID‘s	displays transport stream ID and network ID

Information

Temperature	temperature of terminals board
Device nummer	display of the device number
Device index	display of the device index (hardware)

8.9 Software overview (menu 8)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14	
Version	
AP Controller	9710.02-81.01 Steuercontroller Anschluss-LP V1.06 18.02.2009 JR
FPGA Boot Controller	9710.02-88.01 FPGA Boot Controller(2) V1.02 24.04.08 JR
FPGA	9710.02-87.01 TS-Mux;QAM-Modulator V1.05 13.01.2009 WE,JR
Nios	9710.02-86.01 TS-Manager V1.04 20.02.2009 JR
S2-NIM Controller	9619.05-88.02 S2-NIM-Controller H2V1.02 07.06.2006 PK
Up Converter	9199.01-88.02 internal Controller V2.00 26.06.2008 JH
Back	

Name of device, item number, address in head end

Software version

Controller of terminals board

FPGA boot controller

QAM modulator, TS-Mux (FPGA)

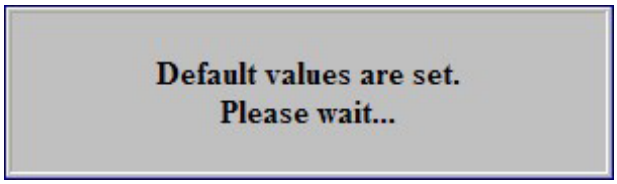
TS manager

S2-NIM controller

Up Convertrer controller

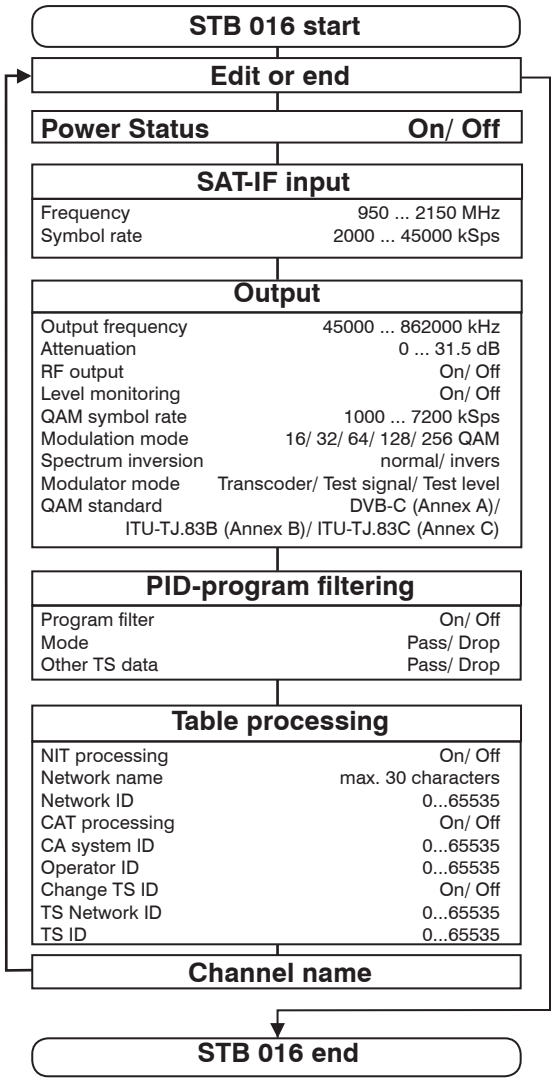
8.10 Factory settings (menu 9)

When request this menu item at first a security query whether it really set all parameters to the factory default settings pops up.



Affirming the query, all settings made on the EEPROM will be deleted and replaced by the default settings. The modul will go back to these default values. Once the setting process is over, there will be automatic return to the main menu. It takes about one minute.

9. Manual menu control with Headend Controller (HCB x00)

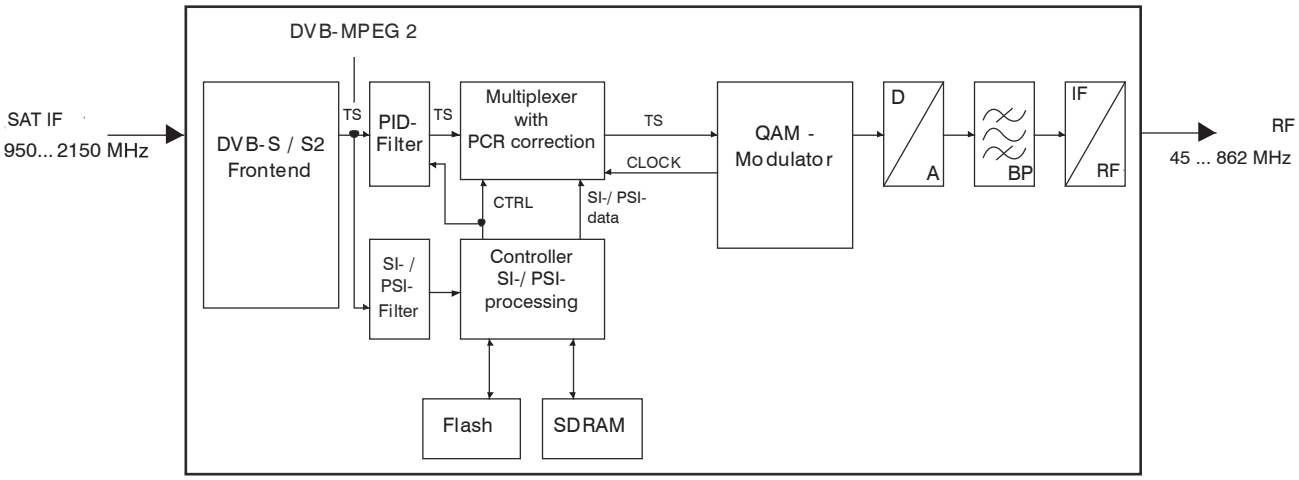


10. SNMP trap messages

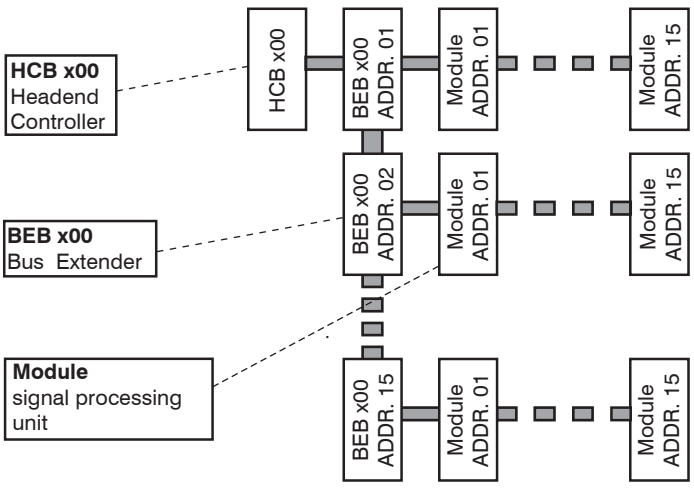
Item	Message	Message type	Message
01	Power fail	CRITICAL	short circuit
02	System Reset	WARNING	reset by internal error
03	Signal OK	INFORMATION	module works correctly
04	Tuner not sync	WARNING	no input signal at the tuner
05	IIC error	CRITICAL	IIC bus error
06	TS-MUX not sync	WARNING	no transport stream at the FPGA
07	Internal controller reset	WARNING	error when accessing internal controller
08	FPGA: Program memory full	WARNING	overflow of program memory in the FPGA
09	FPGA: PID memory full	WARNING	overflow of PID memory in the FPGA
10	FPGA: Directory full	WARNING	overflow of Directory in the FPGA
11	FPGA: FAT memory full	WARNING	overflow of FAT memory in the FPGA
12	FPGA: TS-Packed buffer overflow	WARNING	overflow of TS packet buffer
13	QAM overflow	CRITICAL	overflow of QAM
14	Sync error data FIFO	CRITICAL	data FIFO doesn't work correctly
15	No response to OPEN command	CRITICAL	error internal port

Item	Message	Message type	Message
16	Up Converter: PLL1 not locked	CRITICAL	no funktion at the PLL 1 converter
17	Up Converter: PLL2 not locked	CRITICAL	no funktion at the PLL 2 converter
18	Up Converter: IF input too small	WARNING	IF input too small at the upconverter
19	Up Converter: IF input too large	WARNING	IF input too large at the upconverter
20	Up Converter: RF output too small	WARNING	RF output too small at the upconverter
21	Up Converter: RF output too large	WARNING	RF output too large at the upconverter

11. Block diagram

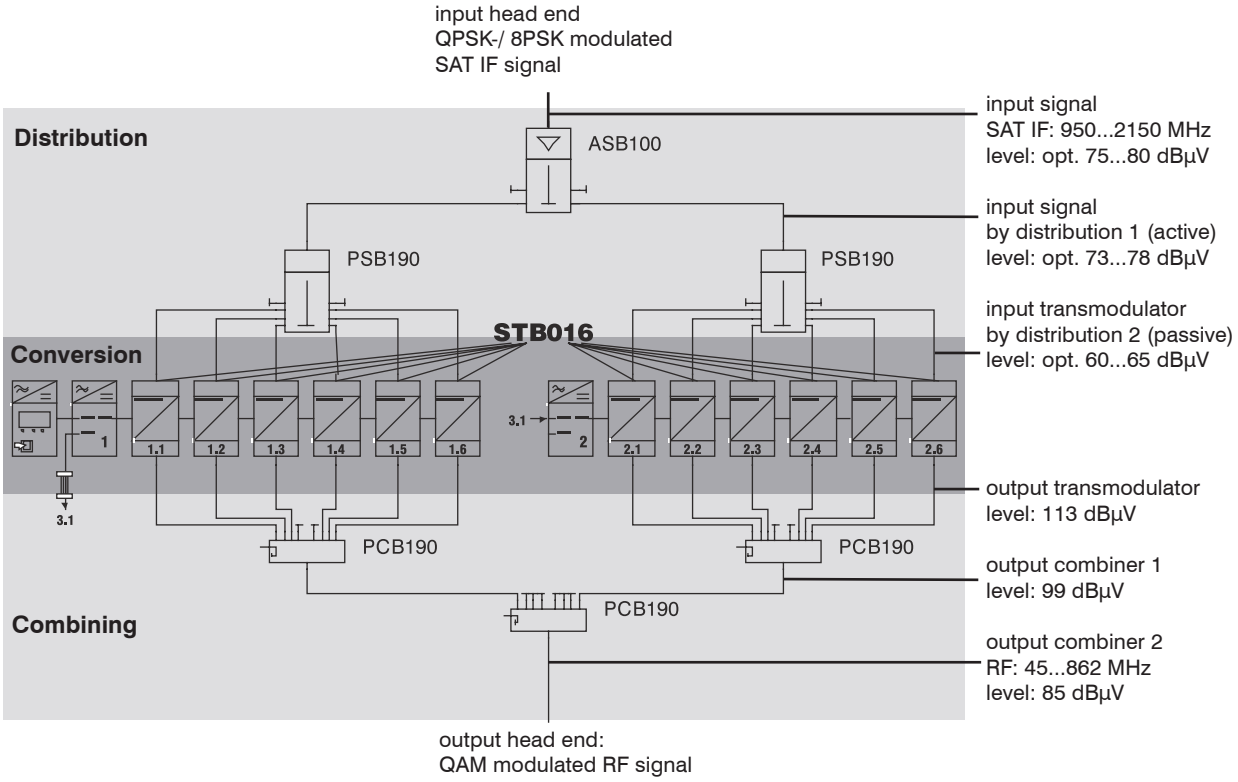


12. Head end bus structure



The number of the possible module connections (01 ... 15) to a BEB x00 depends on the total power consumption of this line!

13. Application example



14. Technical data

SAT IF input

Frequency range	950...2150 MHz
Frequency step	1 MHz
AFC range	± 3 MHz (SR < 10 MSps) ± 5 MHz (SR ≥ 10 MSps)
AGC level range	42 ... 82 dBµV
Connector	F socket
Impedance	75 Ω

DVB-S demodulator (QPSK)

Symbol rate	2…45 MSps
Code rate (Viterbi)	1/2, 2/3, 3/4, 5/6, 7/8
Roll off	35 %
Signal processing	ETS 300 421 [1]

DVB-S2 demodulator (QPSK, 8PSK)

Symbol rate	QPSK	1…34 MSps
	8PSK	1…28.9 MSps
Code rate (LDPC)	QPSK	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
	8PSK	3/5, 2/3, 3/4, 5/6, 8/9, 9/10
Roll off		20, 25, 35 %
Signal processing		ETS 302 307 [2]

QAM modulator

Input data rate	max. 78 Mbps according adjustment symbol rate & QAM constellation
Symbol rate	1.0...7.2 MSps
QAM modulation	ITU-T J.83 Annex B, C, DVB-C

	Annex B	**Annex C**	**DVB-C**
QAM constell.	64; 256	64	16; 32;64; 128; 256
Roll off	12 %, 18 %	13 %	15%
Interleaving	Conv. I=128, J=4	Conv. I=12	Conv. I=12
Forward error correction (FEC)	Reed Solomon (128,122) + Trellis	Reed Solomon (204, 188,8)	Reed Solomon (204, 188,8)

Test signals	according adjustment symbol rate & QAM constellation
Measurement signal	unmod. carrier (signal level)
PSI-/ SI processing	disconnectable
Zero stuffing	continously
Signal processing	EN 300 429 [3] ITU-T J.83 Annex B, C [5]

RF output

Output frequency range	45 ... 862 MHz
Tuning step	125 kHz
Max. output level	116 dBµV
Level adjustment range	0 ... 31.5 dB (0.5 dB steps)
Channel allocation	adjacent channel ability
Connector	F socket
Impedance	75 Ω
Return loss	≥ 18 dB 45 MHz - 1.5 dB/ octave

Signal quality

MER	≥ 45 dB
Shoulder attenuation	≥ 58 dB
Spurious 45...862 MHz	≥ 60 dB
C/N (> 25 MHz space from channel center)	
BW = 4,8 MHz	typ. 80 dB
BW = 6 MHz	typ. 79 dB
BW = 8 MHz	typ. 78 dB
Phase noise	1 kHz; typ. -92 dBc/ Hz 10 kHz; typ. -101 dBc/ Hz 100 kHz; typ. -108 dBc/ Hz
max. frequency stability	30 kHz
Output level stability	± 0.5 dB
Amplitude frequency response channel (8 MHz)	max. 1 dB_{pp}

Operating parameters

Voltage/ current	12 V (± 0.2 V)/ max. 900 mA
Residual ripple of the supply voltage	10 mV_{PP}

Environmental conditions

Temperature range	-10 ... +55 °C
Temperature range for data keeping	5 ... 45 °C
Relative humidity	≤ 80 % (non condensing)
Method of mounting	vertical
Location of mounting	splash-proof and drip-proof

Miscellaneous

Dimensions (l x w x h)	
without 19" - adapter	50 x 276 x 148 mm
with 19" - adapter	50 x 301 x 148 mm
Weight	1,190 g

Delivery content 1x bus connector

15. Glossary

8PSK	**8** **P**hase **S**hift **K**eying
AFC	**A**utomatic **F**requency **C**ontrol
AGC	**A**utomatic **G**ain **C**ontrol
APL	**A**nschluss**pl**atte (Terminals board)
BER	**B**it **E**rror **R**atio
BW	**B**and**w**idth
CA	**C**onditional **A**ccess
CAT	**C**onditional **A**ccess **T**able
DVB	**D**igital **V**ideo **B**roadcasting (-C Cable, -S Satellite, -S2 Satellite 2, -T Terrestrial)
EIT	**E**vent **I**nformation **T**able
ETSI	**E**uropean **T**elecommunications Standards Institute
FAT	**F**ile **A**llocation **T**able
FEC	**F**orward **E**rror **C**orrection
FPGA	**F**ield **P**rogrammable **G**ate **A**rray
HTTP	**H**ypertext **T**ransfer **P**rotocol
I/Q	**I**n-phase/ **Q**uadrature-phase
ID	**Id**entifier
IF	**I**ntermediate **F**requency
IIC	**I**nter-**I**ntegrated **C**ircuit (I^2C-Bus, data bus within device)
IP	**I**nternet **P**rotocol

LDPC	**L**ow **D**ensity **P**arity **C**heck Code
LED	**L**ight **E**mitting **D**iode
MAC	**M**edia **A**ccess **C**ontrol
MER	**M**odulation **E**rror **R**atio
MIB	**M**anagement **I**nformation **B**ase
MPEG	**M**oving **P**icture **E**xperts **G**roup
MPTS	**M**ulti **P**rogram **T**ransport **S**tream
NIM	**N**etwork **I**nterface **M**odule
Nios	product name for a processor
NIT	**N**etwork **I**nformation **T**able
PAT	**P**rogram **A**ssociation **T**able
PCR	**P**rogram **C**lock **R**eference
PID	**P**rogram **Id**entifier
PMT	**P**rogram **M**ap **T**able
PSI	**P**rogram **S**ervice **I**nformation
QAM	**Q**uadrature **A**mplitude **M**odulation
QPSK	**Q**uadrature **P**hase **S**hift **K**eying
RF	**R**adio **F**requency
SDT	**S**ervice **D**escription **T**able
SI	**S**ervice **I**nformation
SNMP	**S**ingle **N**etwork **M**anagement **P**rotocol
SPTS	**S**ingle **P**rogram **T**ransport **S**tream
TS	**T**ransport **S**tream

16. Bibliography

[1] EN 300 421: Digital Video Broadcasting (DVB): Framing structure, channel coding and modulation for 11/ 12 GHz satellite services

[2] EN 302 307: Digital Video Broadcasting (DVB): Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications

[3] EN 300 429: Digital Video Broadcasting (DVB): Framing structure, channel coding and modulation for cable systems

[4] EN 60728-11: Cable networks for television signals, sound signals and interactive services Part 11: Safety (IEC 60728-11:2005); German version EN 60728-11:2005

[5] ITU-T J.83 Digital multi-programme systems for television, sound and data services for cable distribution, Amendment to Annex B and C (2006)

[6] EN 50083-2 : Cabled distribution systems for television and sound signals. Electromagnetic compatibility for equipment; EN 50083-2:2001

[7] RFC 1157 Request for Comments (RFC): RFC Database URL: Http://www.rfc-editor.org/rfc.html

17. Document history

Version	Date	Modification	Author
1.00	18.07.2008	basic document	Poch
1.01	03.09.2009	revision	Häußer
1.02	13.02.2012	revision web sites (LCN)	Häußer
1.03	19.06.2015	new company	Häußer

CE Declaration of Conformity

Manufacturer:	BLANKOM systems GmbH Hermann – Petersilge – Straße 1 07422 Bad Blankenburg Germany
Product Name:	SAT-TV Transmodulator
Type Name:	STB 016
Type N°:	9710.02

BLANKOM systems GmbH confirms that the mentioned products meet the guideline(s) of the Council for the approximation of legislation of the member states.

Electromagnetic compatibility (2004/ 108/ EC)
The following standards are met: DIN EN 50083-2: 2007-04 (EN 50083-2:2006-06)

Low voltage guideline (2006/ 95/ EC)
The following standards are met: DIN EN 60950-1: 2006-04 (EN 60950-1:2006-11)
Information technology equipment -Safety-

Restriction of hazardous substances (2011/ 65/ EC)
The following standards are met: DIN EN 50581: 2013-02 (EN 50581:2012)

Bad Blankenburg, Germany, 2015-06-19

Wolfgang Schlüter
(Managing Director)